# CLAIMS

What is claimed is:

1. A data storage system, comprising:

a host controller configured to communicate with a host, the host controller having a host-end transmitter and a host-end receiver;

a disk controller configured to communicate with a set of disk drives, the disk controller having a disk-end transmitter and a disk-end receiver; and

a set of optical fibers which interconnects the host-end transmitter with the disk-end receiver, and which further interconnects the disk-end transmitter with the host-end receiver;

each transmitter being configured to receive a first electrical input signal and a second electrical input signal, and to provide a light signal having (i) light modulation based on that first electrical input signal and (ii) average power over time based on that second electrical input signal, and

each receiver being configured to receive a light signal and to provide (i) a first electrical output signal based on light modulation of that light signal and (ii) a second electrical output signal based on average power of that light signal over time.

2. The data storage system of claim 1 wherein the set of optical fibers includes:

a first optical fiber which connects the host-end transmitter to the disk-end receiver to convey an inbound light signal from the host-end transmitter to the disk-end receiver, light modulation of the inbound light signal forming a first inbound communications pathway that carries a first set of inbound data at a first inbound data rate, and average power of the inbound light signal over time forming a second inbound communications pathway that carries a second set of inbound data at a second inbound data rate; and

a second optical fiber which connects the disk-end transmitter to the host-end receiver to convey an outbound light signal from the disk-end transmitter to the host-end receiver, light modulation of the outbound light signal forming a first outbound communications pathway that carries a first set of outbound data at a first outbound data rate, and average power of the outbound light signal over time forming a second outbound communications pathway that carries a second set of outbound data at a second outbound data rate.

3. The data storage system of claim 2 wherein the first set of inbound data at the first inbound data rate includes Fibre Channel formatted information for non-volatile storage within the set of disk drives, wherein the second set of inbound data at the second inbound data rate includes environmental information relating to operation of the data storage system.

4. The data storage system of claim 2 wherein the first set of outbound data at the first outbound data rate includes Fibre Channel formatted information retrieved from the set of disk drives, wherein the second set of outbound data at the second outbound data rate includes environmental information relating to operation of the data storage system.

5. A communications assembly, comprising:

a transmitter configured to receive a first electrical input signal and a second electrical input signal, and to provide a light signal having (i) light modulation based on the first electrical input signal and (ii) average power over time based on the second electrical input signal;

a receiver configured to receive the light signal and to provide (i) a first electrical output signal based on the light modulation of the light signal and (ii) a second electrical output signal based on the average power of the light signal over time; and

an optical fiber interconnecting the transmitter with the receiver to convey the light signal from the transmitter to the receiver.

6. The communications assembly of claim 5 wherein the first electrical input signal defines a first set of data at a first data rate, wherein the second electrical input signal defines a second set of data at a second data rate that is slower than the first data rate, wherein the light modulation of the light signal forms a first communications pathway that carries the first set of data at the first data rate, and wherein the average power of the light signal over time forms a second communications pathway that carries the second set of data at the second data rate.

7. The communications assembly of claim 6 wherein the receiver is further configured to disable the second electrical output signal in response to loss of the light signal.

8. A transmitter, comprising:

an electrical interface configured to receive a first electrical input signal defining a first set of data and a second electrical input signal defining a second set of data;

an optical interface configured to output a light signal; and

a transmit circuit coupled to the electrical interface and to the optical interface, the transmit circuit being configured to (i) modulate light within the light signal based on the first electrical input signal to form a first communications pathway that carries the first set of data, and (ii) change average power of the light signal over time based on the second electrical input signal to form a second communications pathway that carries the second set of data.

9. The transmitter of claim 8 wherein the first communications pathway includes a first bit stream that carries the first set of data, wherein the second communications pathway includes a second bit stream that carries the second set of data, and wherein optical interface includes

a light emitting diode configured to (i) vary timing between light pulses to provide the first bit stream of the first communications pathway, and (ii) vary amplitude of the light pulses to provide the second bit stream of the second communications pathway.

10. The transmitter of claim 9 wherein the transmit circuit includes:

average power control circuitry coupled to the light emitting diode, the average power control circuitry being configured to direct the light emitting diode to set the average power of the light signal to one of (i) above a predetermined threshold during a particular time period to provide a first bit value during that particular time period, and (ii) below the predetermined threshold during that particular time period to provide a second bit value during that particular time period, the second bit value being different than the first bit value.

11. A receiver, comprising:

an optical interface configured to receive a light signal;

an electrical interface; and

a receive circuit coupled to the optical interface and to the electrical interface, the receive circuit being configured to direct the electrical interface to output (i) a first electrical output signal defining a first set of data based on light modulation of the light signal and (ii) a second electrical output signal defining a second set of data based on average power of the light signal over time, the light modulation of the light signal forming a first communications pathway which carries the first set of data, and the average power of the light signal over time forming a second communications pathway which carries the second set of data.

12. The receiver of claim 11 wherein the first communications pathway includes a first bit stream that carries the first set of data, wherein the second communications pathway includes a second bit stream that carries the second set of data, wherein the optical interface includes a photodiode, and wherein receive circuit includes:

pulse sensing circuitry coupled to the photodiode, the pulse sensing circuitry being configured to sense timing between light pulses to obtain the first bit stream of the first communications pathway; and

average power sensing circuitry coupled to the photodiode, the average power sensing circuitry being configured to sense amplitude of average power of the light pulses to obtain the second bit stream of the second communications pathway.

13. The receiver of claim 12 wherein the average power sensing circuitry includes:

a comparator configured to provide, for a particular time period, a bit based on a comparison of the amplitude of the average power of the light pulses to a predetermined threshold, the bit having one of (i) a first bit value when the amplitude of the average power of the light pulses is above the predetermined threshold, and (ii) a second bit value when the amplitude of the average power of the light pulses is below the predetermined threshold, the second bit value being different than the first bit value.

14. The receiver of claim 11, further comprising:

a loss-of-signal detector coupled to the electrical interface and to the receive circuit, the loss-of-signal detector being configured to disable the second electrical output signal in response to loss of the light signal.

15. A method for providing multiple communications pathways, the method comprising:

receiving a first electrical input signal defining a first set of data;

receiving a second electrical input signal defining a second set of data; and

outputting a light signal having (i) light modulation based on the first electrical input signal to form a first communications pathway that carries the first set of data and (ii) average power over time based on the second electrical input signal to form a second communications pathway that carries the second set of data.

16. The method of claim 15 wherein the first communications pathway includes a first bit stream that carries the first set of data, wherein the second communications pathway includes a second bit stream that carries the second set of data, and wherein outputting the light signal includes:

varying timing between light pulses to provide the first bit stream of the first communications pathway; and

varying amplitude of the light pulses to provide the second bit stream of the second communications pathway.

17. The method of claim 16 wherein varying the amplitude of the light pulses includes:

setting the average power of the light signal to one of (i) above a predetermined threshold during a particular time period to provide a first bit value during that particular time period, and (ii) below the predetermined threshold during that particular time period to provide a second bit value during that particular time period, the second bit value being different than the first bit value.

18. A method for providing multiple communications pathways, the method comprising:

receiving a light signal;

outputting a first electrical output signal defining a first set of data based on light modulation of the light signal; and

outputting a second electrical output signal defining a second set of data based on average power of the light signal over time, the light modulation of the light signal forming a first communications pathway which carries the first set of data, and the average power of the light signal over time forming a second communications pathway which carries the second set of data.

19. The method of claim 18 wherein the first communications pathway includes a first bit stream that carries the first set of data, wherein the second communications pathway includes a second bit stream that carries the second set of data, and wherein receiving the light signal includes:

sensing timing between light pulses to obtain the first bit stream of the first communications pathway; and

sensing amplitude of average power of the light pulses to obtain the second bit stream of the second communications pathway.

20. The method of claim 19 wherein sensing the amplitude of the light pulses includes:

for a particular time period, providing a bit based on a comparison of the amplitude of the average power of the light pulses to a predetermined threshold, the bit having one of (i) a first bit value when the amplitude of the average power of the light pulses is above the predetermined threshold, and (ii) a second bit value when the amplitude of the average power of the light pulses is below the predetermined threshold, the second bit value being different than the first bit value.

21. The method of claim 18, further comprising:

disabling the second electrical output signal in response to loss of the light signal.